

2005 Transmission Reliability Program Peer Review Report

October 11-12, 2005
Washington Marriott Hotel
Washington, D.C.

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TRANSMISSION RELIABILITY PROGRAM OVERVIEW

The Transmission Reliability Program was reestablished by Congress in 1999 to conduct research on the reliability of the Nation's electricity infrastructure during the transition to competitive markets under restructuring. This Program is in the DOE Office of Electricity Delivery and Energy Reliability. The Transmission Reliability Program develops advanced real time control systems and evaluates electricity market/system reliability interactions to enable full technical and economic integration of all electric supply technologies into the transmission and distribution system. Transmission Reliability activities will provide the necessary system controls and analyses to support the large-scale participation of loads in electricity markets as an ancillary service such as spinning reserves and provide market competition down to the individual customer level.

Federal Role in Transmission Reliability:

- Perform reliability technology research and development in the absence of market-based incentives for the power sector to perform this R&D.
- Conduct third-party evaluations of electricity market designs and develop technology-based electricity policy options.

The Program's approach for improving the electricity delivery infrastructure is to develop and apply advanced computing, sensing, power electronics, communications, and control technologies to provide real time system control for reliable, efficient operation of the nation's electric power system under both normal and emergency operating conditions.

The Transmission Reliability Program performs analyses and develops technologies in four program areas: Real Time Grid Reliability Management, Load as a Resource, Reliability and Markets, and Reliability Technology Issues and Needs Assessment.

▪ ***Real Time Grid Reliability Management (RTGRM)***

Objective: Develop and apply a new generation of methods and technologies for optimizing the utilization of the North American power grid under restructuring while maintaining system reliability. RTGRM develops technologies leading to automated system reliability assessment and control, based upon real time system measurements. High-speed communications and distributed intelligent controllers will adjust power electronic network management devices, and actively suppress disturbances with only limited human supervision. Information from RTGRM will enable reliable operation of the electric grid, and efficient operation of competitive power markets. Near term, this activity is developing data collection and visualization tools that will provide system operators with a real time view of grid conditions, and longer term allow assessment of operator compliance with grid reliability standards.

▪ ***Load as a Resource***

Objective: Improved reliability and system efficiency through responsive demand. This activity assesses the capabilities of load to participate in electricity markets as a reliability resource. This activity will demonstrate the value of load as a resource through field evaluation where load responds to price signals or as an ancillary service such as spinning reserves.

- **Reliability and Markets**

Objective: Reliability and markets evaluates options to strike the appropriate balance between ideal economic market mechanisms and traditional utility operating practices that will provide inexpensive and reliable electric services for consumers. This activity engages in interdisciplinary research involving power system engineering and market economics, and responds to the need for a strong Federal role to provide unbiased, third-party policy options on restructuring for Federal and State decision-makers. This activity is conducting market auction behavioral experiments that indicate how generators and demand response will react to alternative electricity market designs. These experiments are an accurate and low-cost method for analyzing proposed market designs before they are implemented. A near term priority in this activity will examine how loads can participate in energy and reliability services markets.

- **Reliability Technology Issues and Needs Assessment**

Objective: Identify the R&D needs for a reliable electricity delivery infrastructure consistent with the requirements of competitive electric markets. This area identifies emerging critical issues for electric reliability, analyzes these issues to identify gaps in reliability R&D, and prioritizes and initiates planning for needed Federal research and technology development. This activity is working with industry stakeholders to develop a framework for grid reliability performance and reliability indicators.

The Transmission Reliability Program budget history is as follows:

FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
2.5	2.4	4.9	4.7	5.2	4.4	4.7	4.0

(Dollars in Millions)

The Transmission Reliability Program is implemented through a DOE National Laboratory/industry/university partnership called the Consortium for Electric Reliability Technology Solutions (CERTS). CERTS was formed to develop and commercialize new methods, tools, and technologies to protect and enhance the reliability of the U.S. electric power system under the emerging competitive electricity market structure.

Members of CERTS include:

- Lawrence Berkeley National Laboratory
- Electric Power Group
- Oak Ridge National Laboratory
- Power Systems Engineering Research Center (PSERC)
- Sandia National Laboratories
- Pacific Northwest National Laboratory

For additional information on CERTS, see <http://certs.lbl.gov>

For information on the Transmission Reliability Program, see: <http://electricity.doe.gov> under Electric Power Systems R&D Division.

THE PEER REVIEW

The U.S. Department of Energy's Transmission Reliability Program conducted an independent peer review of its projects on October 11-12, 2005, at the Washington Marriott Hotel in Washington DC. The results of the review are an important element of management's plans to continually adjust and improve the Department's Transmission Reliability program, and to provide valuable feedback to researchers.

The review was structured into 4 areas:

- Real Time Grid Reliability Management
- Load as a Resource
- Reliability and Markets
- Reliability Technology Issues and Needs Assessment

THE PANEL

The review covered 18 presentations as shown in the Agenda at Appendix A. Participation as a reviewer required that there be no financial relationship with DOE or the presenting research organizations, or conflict of interest with same. The names and affiliations of the review panel are listed below:

Reviewer Affiliations:

Navin Bhatt - American Electric Power

Merwin Brown - California Institute for Energy and Environment

Hamid Elahi, Ph.D - General Electric Company

David Hawkins - California Independent Systems Operator

REVIEW CRITERIA

The reviewers evaluated each project on the basis on the principal investigator's oral presentation, written documentation provided prior to the review, and a question and answer period following the investigator's presentation. Each reviewer was provided a workbook prior to the review that included an evaluation form for each project, hard copies of each presentation, and a one-page summary and budget history for each project. The evaluation form was organized using the following review criteria:

- 1) *Value in relation to programmatic goals?*
- 2) *What is the technical merit of the work?*
- 3) *Does the project place the correct emphasis on transfer of technology to stakeholders?*
- 4) *What is the overall performance of this project?*

The completed evaluation form for each project is the reviewer's official record of evaluation, both quantitative and qualitative. A numerical score for each of the four criteria was selected from the rating tables on a scale of 1-10. The rating scale is:

Excellent: 9 – 10
Good: 6 – 8
Marginal: 3 – 5
Unsatisfactory: 1 – 2

Space for written comments was provided on the evaluation form. Specific comments on the strengths and weaknesses of a project and recommendations to improve a project were strongly encouraged.

GUIDELINES

Oral Presentations: The principal investigator for each project was urged to prepare his oral presentation in the order of the evaluation criteria to assist reviewers in scoring. Each presenter was allotted 30 minutes for his presentation, and an additional 10 minutes for questions from the review panel or the general audience.

COMMENTS & RESULTS

Completed evaluation forms were given to the peer review monitor, who calculated quantitative scores and transcribed written comments verbatim. Panelist's comments and scores for each presentation were then consolidated and provided to the Transmission Reliability Program manager for evaluation and feedback to project investigators. Following are general comments from the peer reviewers, and a summary of the scores resulting from the review.

- This is a very important project and the researchers are doing some ground breaking work. New thinking and new approach to what we could do to improve reliability of the power grid. Continue work in this area.
- This is fundamental research, on the medium to long time frame horizon. The wide-area voltage control concepts may be applicable to all the North American Interconnections, whereas the SPS piece would appear difficult to coordinate and implement within the Eastern Interconnection.
- Need to continue the development of concepts based on “response based controls” such as grid damping ratios versus event driven controls.
- A critical issue is the size of the communication pipeline that is required to bring back this information, the cost of this pipeline, and from a security standpoint whether bringing all station IED data into the EMS is the right thing to do.
- Essential work in preparation of full scale implementation of an open and non-discriminatory grid.
- Refocus on Reliability following the 2003 blackout. Markets and Operations must be integrated to ensure grid reliability. Goal is by 2009 to have a valid RTO market design validated with simulation. Developing a Super OPF for use in the simulation testing. Funded Resource Adequacy project this year.
- Concepts are a challenge for most regulators to understand and to set rules that allow load serving entities to enter into long term contracts. If the independent power producers are to get long term contracts, the regulators must reduce the risk of signing long term contracts.
- Market Design is a very important issue. As proven in California, if done poorly, it can lead to disastrous reliability results. The East and Midwest markets today are struggling with what the proper structure and design should be for their markets in order to foster competition, encourage appropriate investment and maintain reliability. This research is very important to the industry and future reliability of the grid as it supports the making of good public policy decisions.
- Good personnel on the project.
- Excellent innovative progress in an area with a great deal opportunities to enhance grid loading.

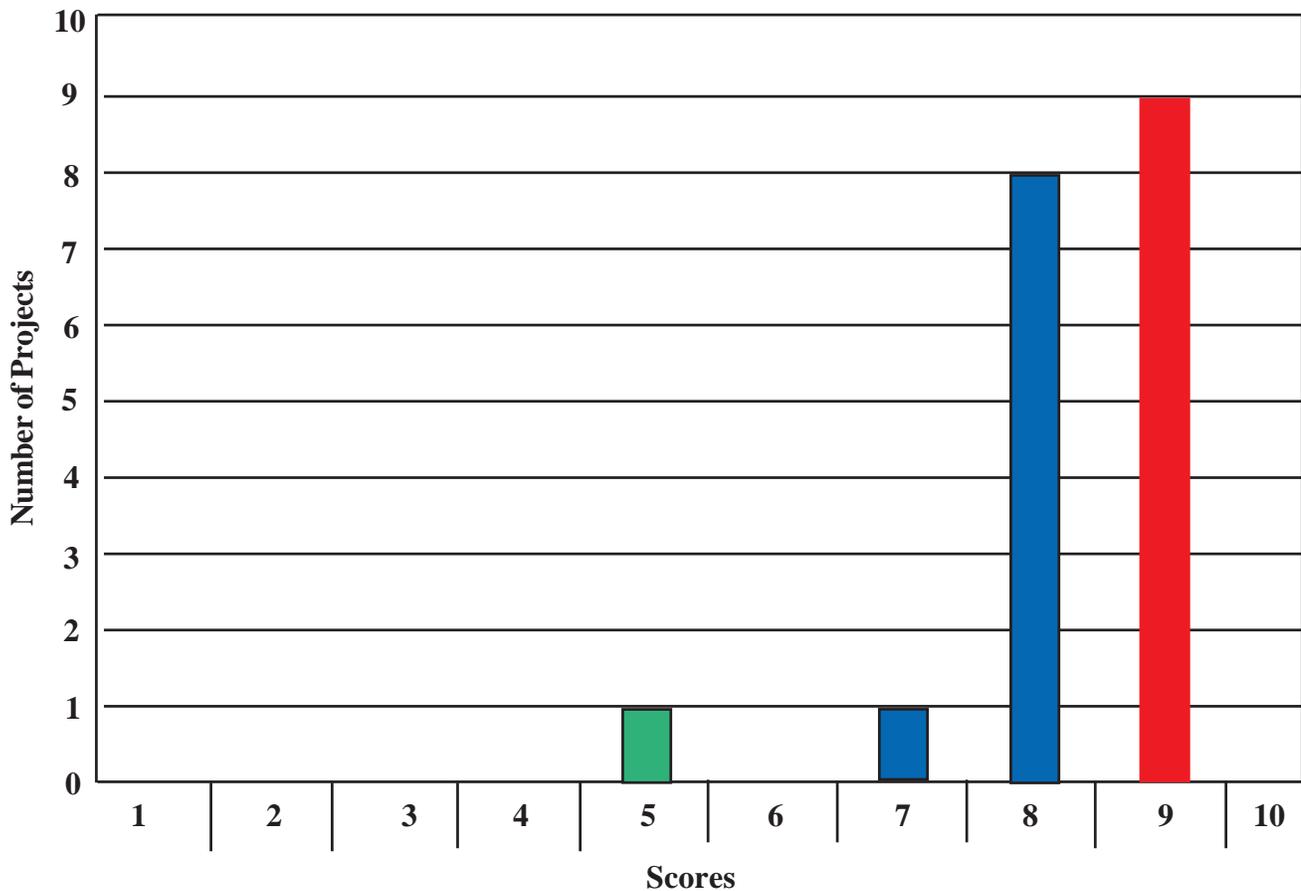
SCORES

Criteria 1- “ Project in Relation to Programmatic Goals ”

The average for all projects -- **8.6**.

The number of projects and relevant percentage by rating category are:

	Excellent (9-10):	9 projects (50%)
	Good (6-8):	8 projects (44%)
	Marginal (3-5):	1 project (6%)
	Unsatisfactory (0-2):	none

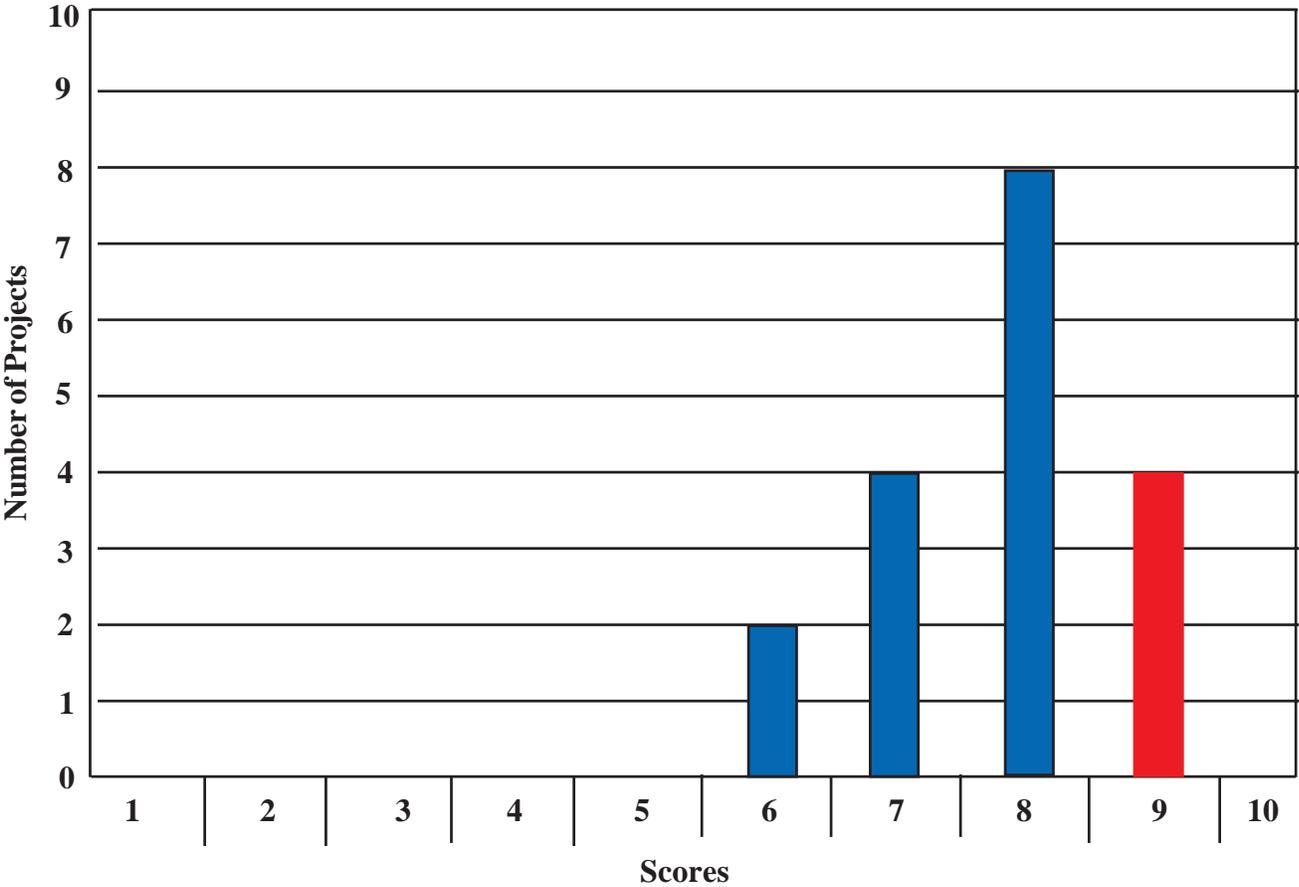


Criteria 2- “ Technical Merit of the Work”

The average for the all projects -- **8.1**.

The number of projects and relevant percentage by rating category are:

	Excellent (9-10):	4 projects (22%)
	Good (6-8):	14 projects (78%)
	Marginal (3-5):	none
	Unsatisfactory (0-2):	none

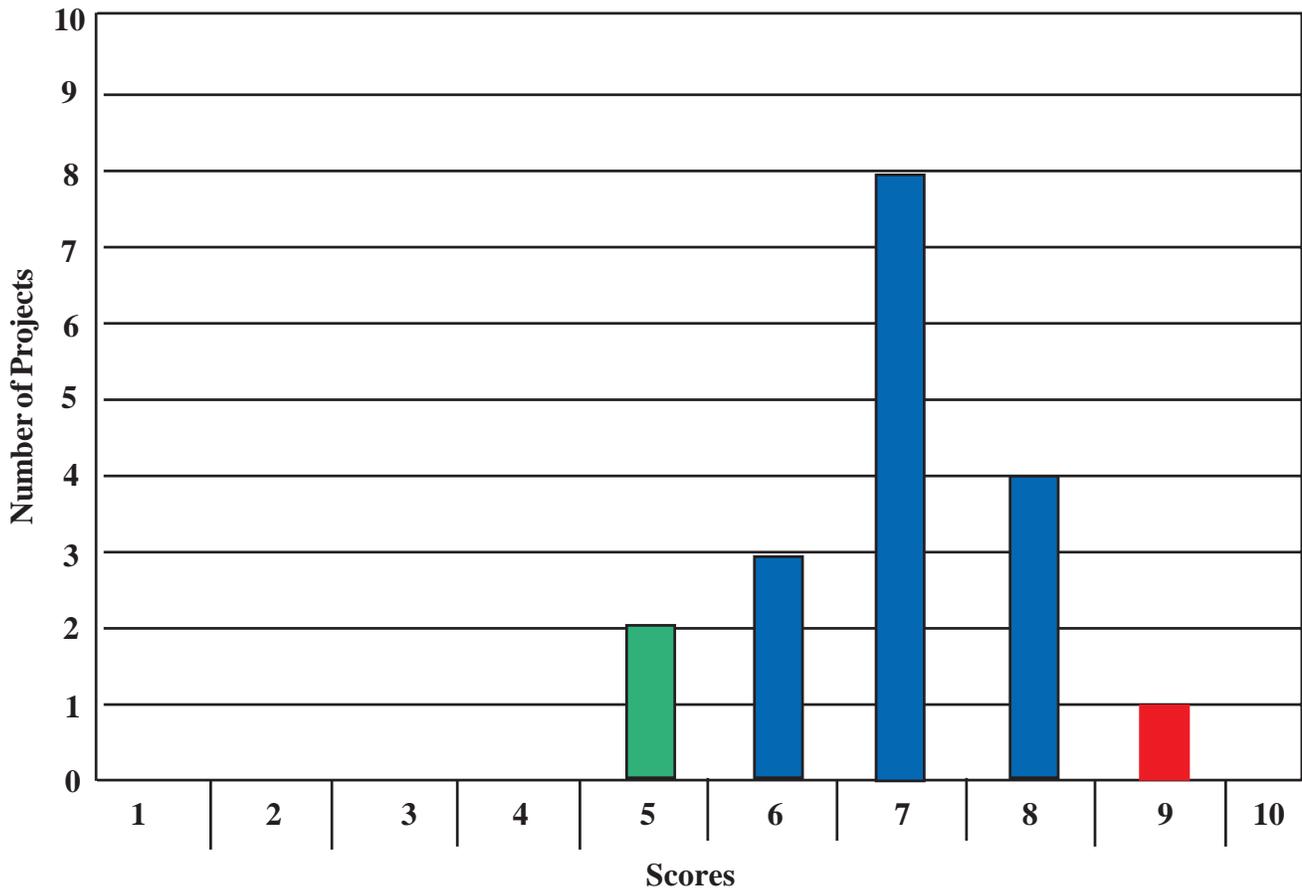


Criteria 3- “ Project in Terms of its Technical Transfer”

The average for all projects -- **7.2**.

The number of projects and relevant percentage by rating category are:

	Excellent (9-10):	1 projects (11%)
	Good (6-8):	15 projects (82%)
	Marginal (3-5):	2 projects (11%)
	Unsatisfactory (0-2):	none

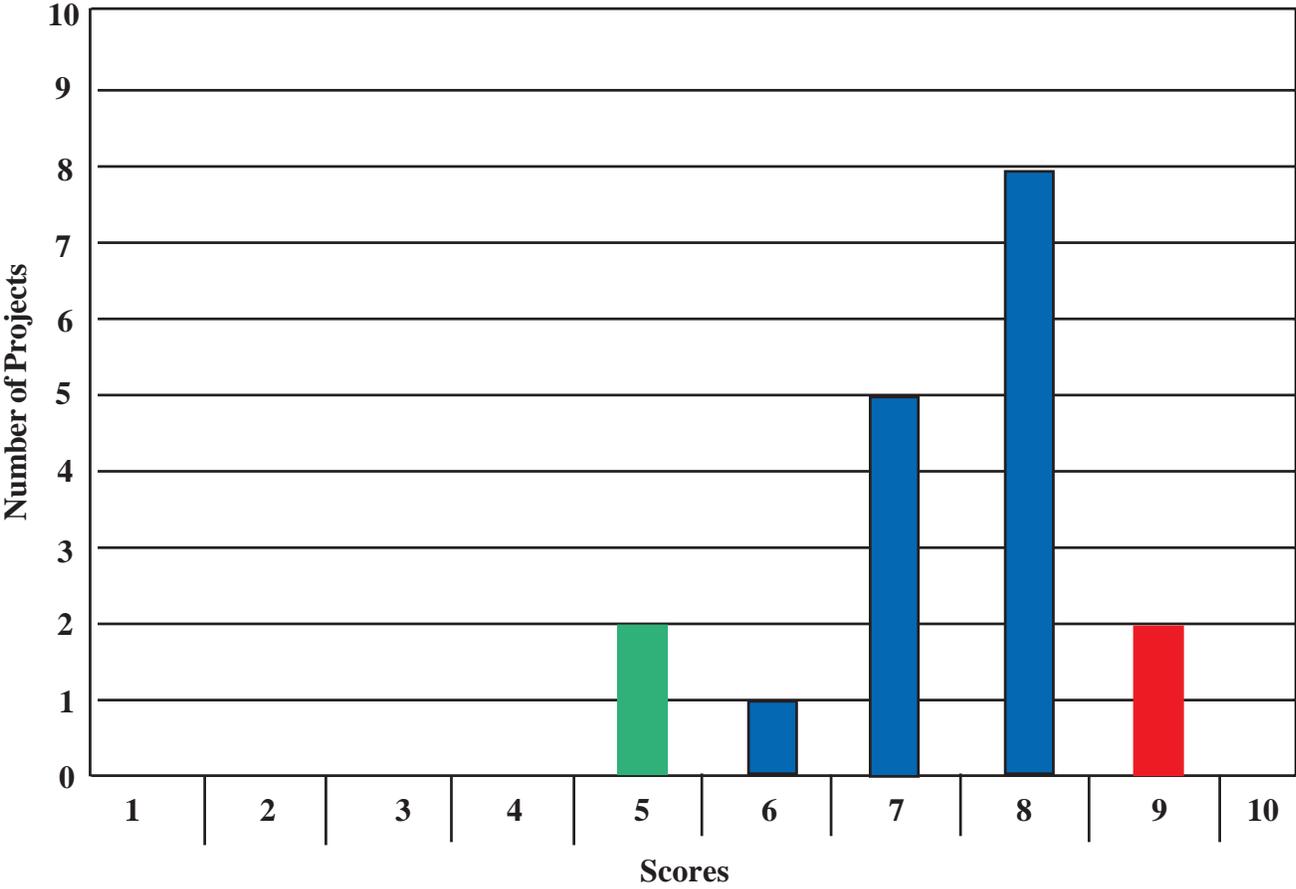


Criteria 4- “ Overall Performance of Projects”

The average for all projects -- **7.7**.

The number of projects and relevant percentage by rating category are:

	Excellent (9-10):	2 projects (11%)
	Good (6-8):	14 projects (78%)
	Marginal (3-5):	2 projects (11%)
	Unsatisfactory (0-2):	none



APPENDIX A

Agenda

**U.S. Department of Energy
Transmission Reliability Program Peer Review
Washington Marriott Hotel
October 11-12, 2005**

Agenda

DAY 1 - OCTOBER 11

- 8:30 – 9:00 am** Continental Breakfast
- 9:00 – 9:10 am** Welcome - Phil Overholt, Manager, DOE Transmission Reliability Program
- 9:10 – 9:20 am** DOE Perspectives – Kevin Kolevar, Director, Office of Electricity Delivery and Energy Reliability
- 9:20 – 9:30 am** NERC Perspectives – Bob Cummings, Director, Reliability Performance and Engineering Support

Time REAL TIME GRID RELIABILITY MANAGEMENT

- 9:30-9:45 am** Overview of Real Time Grid Reliability Management – Carl Imhoff, PNNL
- 9:45-10:15 am** Eastern Interconnection Phasor Project – Matt Donnelly, PNNL
- 10:25-10:40 am** Break
- 10:40-11:10 am** Reliability Adequacy Tools – NERC ACE/AIE – Carlos Martinez, EPG
- 11:20-11:50 am** Real Time Control – Anjan Bose, PSERC/WSU
- 12:00-1:00 pm** Lunch (on your own)
- 1:00-1:30 pm** Adaptive Islanding – Vijay Vittal, PSERC/ASU
- 1:40-2:10 pm** Role of Substation Information – Mladen Kezunovic, PSERC/TAMU
- 2:20-2:40 pm** Break

Time RELIABILITY AND MARKETS

- 2:50-3:00 pm** Overview of Reliability and Markets– Bob Thomas, PSERC/Cornell
 - 3:00-3:30 pm** Experiments with Multidimensional Markets – Tim Mount, PSERC/Cornell
 - 3:40-4:10 pm** Market Power Monitoring - Bernard Lesieutre, LBNL
 - 4:20-4:50 pm** Public Goods Aspects of Reliability – Bill Schulze, PSERC/Cornell
- Adjourn

Transmission Reliability Program Peer Review Final Report

DAY 2 – October 12

8:30-9:00 am	Continental Breakfast
Time	LOAD AS A RESOURCE
9:00-9:10 pm	Overview of Load as a Resource – Joe Eto, LBNL
9:10-9:40 pm	Load Participation in Reserves Markets: Experiences in U.S. and Internatioanally – Brendan Kirby, ORNL
9:50-10:20 pm	Spinning Reserve from Large Load Trial with XCEL Energy Cabin Creek Pumped Storage Unit– John Kueck, ORNL
10:30-10:45 am	BREAK Reliability Technology Issues and Needs Assessment
10:45-11:15 am	Examination of Centralized Dispatch in the Midwest – Bernie Lesieutre, LBNL
11:25–11:55 am	Grid Metrics – Joe Eto, LBNL
12:05-1:00 pm	Lunch (on your own)
1:00-1:30 pm	Transmission Test Facility – John Stovall, ORNL
1:40-2:10 pm	Advanced Composite Conductor Field Demonstration – Colin McCullough, 3M
2:20-2:45 pm	Break
2:45-3:15 pm	PowerGrid Simulator Project – Chika Nwankpa, Drexel University
3:25-3:55 pm	
	ADJOURN

APPENDIX B

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